

Remarks/Arguments

Reconsideration of this application is requested.

Claim Status

Claims 1-6 are pending. Claims 1 and 3-5 are amended.

Claim Rejections – 35 USC 102

Claims 1 and 2 are rejected under 35 USC 102(b) as anticipated by Wada (US 5,220,185). In response, applicant traverses the rejections, and amends claim 1 to more clearly distinguish over Wada.

The solid image capturing element according to the present invention has a structure in which a semiconductor region of one conductive type 4 is formed closer to the surface of a semiconductor substrate of one conductive type 6 and a semiconductor region of reverse conductive type 8 is formed in deeper portions than the semiconductor region of one conductive type 4. A first semiconductor region 10 and a second semiconductor region 60 having a higher dopant concentration than that of the first semiconductor region 10 are formed in the semiconductor region of reverse conductive type 8. Further, a horizontal shift register is formed in the first semiconductor region 10, while an output section is formed in the second semiconductor region 60.

Claim 1 is amended as follows to clarify these features:

...a semiconductor region of one conductive type is formed closer to a surface of a semiconductor substrate of one conductive type, while a semiconductor region of reverse conductive type is formed in a deeper portion than the semiconductor region of one conductive type, and a first semiconductor region and a second semiconductor region having a higher dopant concentration than that of the first semiconductor region are formed in the semiconductor region of reverse conductive type...

Wada does not disclose such a structure. Wada enables independent selection of a dopant concentration of an output gate portion 16 without considering

effects to the other portions by a structure in which a final stage of a charge transfer section 15 consists only of a first level gate electrode 13 and output gate section 16 consists of a second level electrode 14. Wada describes that charge transfer section 15 is formed to prevent the potential level from becoming too deep. Further it is understood from FIGs. 1-4 that potential adjusting dopant regions 17, 18 are formed in a layer of a conductive type the same as that of a substrate 11 (n-type). A layer having a reverse conductive type (p-type) with a uniform dopant concentration is formed in a lower layer than the n-type conductive layer.

By contrast, as recited in claim 1, the semiconductor region of the reverse conductive type (p-type) is formed in a deeper portion than the semiconductor region of one conductive type, and a plurality of semiconductor regions having different dopant concentrations are provided in the semiconductor region of reverse conductive type (p-type).

Since Wada does not disclose each and every feature of claim 1, it cannot anticipate claim 1 or claim 2 dependent thereon. The rejections of claims 1 and 2 under 35 USC 102(b) should therefore be withdrawn.

Claim Rejections – 35 USC 103

Claim 3 is rejected under 35 USC 103(a) as obvious over Wada in view of Yutani (US 5,040,038) and Oda (US 4,805,026). Claims 4 and 6 are rejected as obvious over Wada in view of Harada (US 5,898,195). Claim 5 is rejected as obvious over Wada in view of Harada, Yamada (US 2002/0039144) and Tohyama (US 6,018,169). In response, applicant traverses the rejections, and amends independent claim 4 to clarify the present invention relative to the cited references. Claims 3 and 5 are also amended for consistency with claims 1 and 4.

Claim 3

Claim 3 depends from claim 1. In this regard, Yutani and Oda do not remedy the deficiencies of Wada discussed above with respect to claim 1. Yutani discloses a structure in which a p-type dopant layer 16 is formed on a p-type semiconductor substrate. Oda does not describe a substrate structure. Therefore, claim 3 is

allowable for the same reasons discussed with respect to claim 1 above, and the rejection of claim 3 under 35 USC 103(a) should be withdrawn.

Claims 4-6

Claim 4 is an independent method claim and is amended in similar fashion to claim 1. In particular, claim 4 is amended to recite:

...a first step of forming closer to a surface of a conductive semiconductor substrate, a first reverse conductive semiconductor region having a first dopant concentration;

a second step of forming in a deeper portion in the conductive semiconductor substrate than the conductive semiconductor region, a second reverse conductive semiconductor region having a second dopant concentration which is higher than the first dopant concentration...

Claim 4 distinguishes over Wada for the same reasons as set forth for claim 1. Harada, which discloses a structure in which a first conductive type semiconductor substrate 2 comprises a high-resistance semiconductor region 5 and a second conductive type (p-type) semiconductor region 4 formed thereon, does not remedy the deficiencies of Wada. Accordingly, since Wada and Harada do not disclose or suggest each and every feature of claim 4, claim 4 and claim 6 dependent thereon are not obvious over Wada in view of Harada.

Claim 5 depends from claim 4 and is allowable for the same reasons as discussed above for claim 4. In this regard, Yamada and Tohyama do not remedy the deficiencies of Wada and Harada discussed above. Yamada discloses a structure in which a p-type impurity doped region 11b is formed on an n-type semiconductor substrate 11a. Tohyama discloses a structure in which a p-type well 2 is formed on an n-type substrate 1.

In sum, none of Wada, Yutani, Oda, Harada, Yamada or Tohyama describe a structure of the present invention in which the reverse-type (p-type) semiconductor region is formed at a deeper portion than the semiconductor region of one

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conductive type and the plurality of semiconductor regions having different dopant concentrations are formed in the reverse-type (p-type) semiconductor region. For these reasons the rejections of claims 1-6 under 35 USC 102 and 35 USC 103 should be withdrawn.

Conclusion

Applicant believes the foregoing amendments comply with requirements of form and thus may be admitted under 37 CFR 1.116(b). Alternatively, if these amendments are deemed to touch the merits, admission is requested under 37 CFR 1.116(c). In this connection, these amendments were not earlier presented because they are in response to matters pointed out for the first time in the final Office Action. Lastly, admission is requested under 37 CFR 1.116(b) as presenting rejected claims in better form for consideration on appeal.

This application is now believed to be in condition for allowance. The Examiner is invited to contact the undersigned to resolve any issues that remain after consideration and entry of this amendment. Any fees due with this response may be charged to our Deposit Account No. 50-1314.

Respectfully submitted,
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